the other end so that no values are lost. Thus, the shift register can include data defining a single waveform which is continuously shifted and looped within the shift register, so that waveform can be observed as repeating at any of the shift register's taps.

[0067] FIG. **7** shows channel-specific phase tuning logic used by a channel to control the phase for the demodulation signal for that channel. Shift register **614** is shown. In some embodiments, only a single shift register is used for all channels. The taps of the shift register are connected to different inputs of multiplexer **700**. Each tap can be connected to the multiplexer through a line comprising a plurality of bits sufficient to provide the value stored in the cell of the shift register associated with that tap. Therefore, the output of the multiplexer may also be a channel including several parallel lines. While the logic of only one channel is shown in FIG. **7**, in practice, the taps of the shift register can be connected to a plurality of multiplexers each associated with a respective channel.

[0068] The multiplexer can be controlled by a digital phase selector signal **701**. The phase selector signal defines what phase should be used for the demodulation signal of a particular channel. Therefore, a different phase selector signal may be used for each channel. The phase selector signal may also change over time, as the desired phase can change over time.

[0069] The phase selector signal selects which tap is to be forwarded to the output of the multiplexer to become multiplexer output signal **702**. As discussed above, each tap can, over time, present multiple digital values defining a demodulation wave. The different taps present the demodulation wave at different phases. Thus, by selecting a signal originating from one of the taps based on the phase selector signal, the multiplexer can provide a demodulation wave of a particular phase as its output signal **702**.

[0070] The phase selector is a digital value representing the desired phase. The phase selector is also preferably a multi-bit value. The phase may be defined through the phase selector in terms of units which are related to the number of values of the shift register and the look-up table. For example, considering the phase in radians, and assuming that the number of values representing a single wave iteration in the shift register is n, then the phase represented by each unit of the phase selector signal is:

$$1 \text{ phase selector signal unit} = 2\pi/n \qquad \text{EQ1}$$

[0071] Therefore, if, for example, the value of the phase selector signal is 4 (100 in binary), and the shift register includes 64 values defining a single wave iteration, then the phase selector signal would represent a phase of $4\times 2\pi/64=\pi/8$. The generation of the phase selector signal is discussed in more detail below.

[0072] As discussed above, the output signal **702** is a digital representation of a demodulation wave having a correct phase for the particular analog channel in which it appears. This signal is sent to Digital to Analog Converter (DAC) **705**, to produce the actual analog demodulation signal (signal **316**). As discussed above, signal **316** is sent to mixer **304** for demodulation purposes. In one embodiment, the DAC may be part of the mixer. In another, embodiment the mixer may be a quantized mixer and thus may accept the digital signal **702** without a need for conversion.

[0073] FIG. **8** shows logic for the generation of the various phase selector signals for the various channels. FIG. **8** shows a plurality of channel specific phase tuning circuits similar to that shown in FIG. **7** (only circuits **800** and **801** are shown due to limited space but other circuits can be present). Each circuit is connected to the taps of shift register **610**, as discussed above.

[0074] An embodiment of the present invention is designed under the assumption that the phase difference between a signal received at a particular channel from the multi-touch display, and the original stimulation signal Vstim at any time is a sum of two components—a channel specific phase delay depending on the column or the channel, and a row specific phase delay depending on the particular row that is being stimulated at that time. While this may not be an entirely correct assumption, in practice it has been found to be a sufficiently precise one for the purposes of the present embodiment.

[0075] Row register **805** can be used to hold values of the phase difference contributed by each row (i.e., row specific phase delay values). Therefore, the row register can include a plurality of values equal to the number of rows in the multi-touch screen. In some embodiments, close rows can be grouped together for the purposes of phase calculation, and thus the row register can only include values for each group of two or more rows. Thus, each value in the shift register can be a digital number reflective of the phase contributed by an associated row of the multi-touch display. The values represent the phase in units discussed above with reference to the phase selector signal **701**. The different values need not be equal.

[0076] A plurality of cells of the row register (where the values are held) may each feature a tap for reading the values. Each tap can include multiple lines to allow reading of multi-bit values. The row register can also include an interface for storing the row specific phase values. This interface may be the taps as well.

[0077] The taps of the row register are connected to a multiplexer **806**. The multiplexer selects one of the values based on row selection signal **807**. The row selection signal can be a multi-bit signal that signifies which row is being stimulated at a specific time. The row selection signal can be generated and provided by channel scan logic **110** as part of the control signals (see FIG. **1**). Channel scan logic **110** controls the stimulation of the multi-touch display and therefore can easily be used to provide a signal indicating which row is being stimulated at any time.

[0078] Thus, the row selection signal causes the multiplexer to output a row specific phase delay value associated with the row that is currently being stimulated. As time passes and different rows are stimulated, the row selection signal can change and different values representing the row specific phase delay of different rows are output by multiplexer **806**.

[0079] Plural channel phase registers are also provided (only channel phase registers **810** and **811** are shown due to limited space but other registers can be present). Each channel phase register is associated with a specific channel of the analog channels. Therefore, each channel phase register is associated with a channel or column electrode of the multi-touch screen. However, as with the row specific phase delay values, in an alternative embodiment multiple channels can use one channel phase register.

[0080] Each channel phase register holds a value which indicates a channel specific phase delay for that particular channel. The value in each channel phase register may be multi-bit. The value of each channel phase register is sent to